BRIEFER ARTICLES.

Synchytrium on Geranium Carolinianum.—(With plate IV.)—On the fourth of February of last year, some distorted leaves were gathered from *Geranium Carolinianum* L. growing in a low place in the botanical garden at Baton Rouge, La., and examination showed the distortions to be due to a *Synchytrium.* On the margins of some of the lobes, and extending in along the veins, on the lower surface, were purple-red swellings. The hypertrophy of the diseased parts was in many places so great as to cause a cupping of the upper surface. The older swollen portions were brown, and had a sticky feel, and the centers of the confluent pustules composing them were depressed, giving the appearance of small cups placed side by side (fig. 1). The pustules were almost entirely confined to the blades of the leaves.

On the date mentioned, only one Geranium was found affected with Synchytrium but in the same locality, three weeks later, the disease had spread to a number of individuals, and the red swellings were numerous on both petioles and blades. On leaves recently attacked, single red pustules were scattered here and there over the lower surface, occasionally on the upper, but on those longest subjected to the action of the fungus, the pustules had multiplied and become confluent, giving the appearance observed on the leaves first collected.

A section through one of these pustules, in a direction perpendicular to the surface of the leaf, shows an elongated, usually pear-shaped cavity (figs. 2 and 3), filled with a coarsely granular, reddish brown substance whose particles cohere into a sort of network of varying openness of texture. Toward the lower part of the cavity, the granular material becomes finer and more compact (fig. 3), and imbedded in it is either a sorus or a resting-spore; in the material examined, sori were far more numerous than resting-spores.

The resting-spores have a dark brown, laminated, outer covering, and a delicate, colorless, inner coat (figs. 4 and 5), enclosing yellowish granular contents, bearing occasional oil globules. These spores vary greatly in size, ranging from 35μ to 150μ in diameter. The smaller ones often lack the surrounding granular deposit that seems always to attend the larger resting-spores and sori, and as many as four are frequently found in the same cavity (fig. 5). The outer coat of the small spores also appears more compact and more close fitting than that of the large ones (figs. 5 and 4). The large spores are usually spherical, but not infrequently ellipsoidal, and in very rare cases are crescent

shaped. These marked differences between the large and small resting-spores would indicate the possibility that the larger ones are sori in process of formation, and whose contents have not yet broken up into sporangia.

The sori are usually spherical, occasionally ellipsoidal, and range from 75μ to 125μ in diameter. The outer covering of the sori is essentially the same as that of the large resting-spores; the inner sack is thin and colorless, and encloses numerous sporangia (fig. 6). The sporangia are irregularly polyhedral, and have delicate, colorless walls filled with finely granular, reddish yellow contents. They vary from 20μ to 37μ in diameter (fig. 7).

The cells of the tissue surrounding the spore-bearing cavities are usually filled with a red sap that gives to the pustules their purple-red color. The hypertrophy seems to be mainly due to multiplication rather than enlargement of the cells; these are noticeably increased in size only in that part of the pustule immediately surrounding the upper part of the cavity (fig. 3). The enlarged cells have much thinner walls than do those of the normal size, and as the pustule ages, these thin walls break away and leave a large opening through the epidermis into the cavity below. This exposure of the reddish brown substance within probably gives to the older diseased parts the sticky feel mentioned above.

The only representative of the Geranium family given in Farlow and Seymour's Provisional Host-Index as a host for Synchytrium, is *Erodium cicutarium* L'Her. The naked-eye appearance of the Synchytrium on Geranium is very similar to that of *S. papillatum* Farl., on Erodium, but the sori average considerably smaller, and the resting-spores have a much greater range of size. Schroeter mentions *S. aureum* Schroeter, as occurring on *Oxalis stricta* L., in Silesia, but the Synchytrium in question has not the characteristics of S. aureum. Neither Saccardo's Sylloge Fungorum, Schroeter's Kryptogamen-Flora von Schlesien, nor Rabenhorst's Kryptogamen-Flora von Deutschland, Œsterreich und der Schweiz gives Geranium as a host for Synchytrium. It is possible that the Synchytrium on Geranium Carolinianum is a new species, and if so, I would propose the name Synchytrium Geranii.

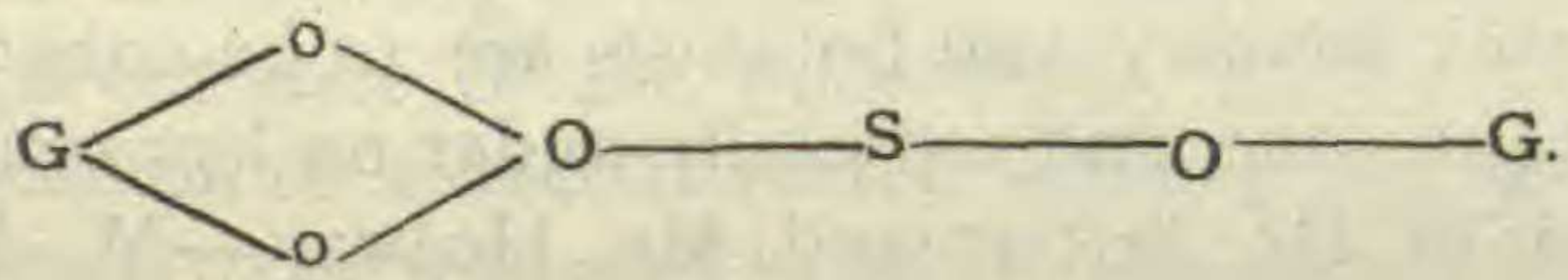
Note.—Since writing the above, I find in the herbarium of the University of Michigan a specimen labeled *Synchytrium Geranii*, E. & G., College Station, Texas. In reply to my inquiry in regard to it, Mr. Ellis writes me that the fungus was first named *S. Geranii* E. & G., and the name was afterwards changed to *S. Fairchildii* E. & G., but neither was ever published.—Ida Clendenin, *Baton Rouge, La.*

Explanation of Plate IV.—Fig. 1. Lobe of leaf of *Geranium Carolinianum* L., attacked by *Synchytrium*. Slightly magnified.—Fig. 2. Section through confluent pustules on vein of leaf. Section does not pass exactly through center of pustules; × 60.—Fig. 3. Section through center of pustules; granular mass almost fills the cavity, and resting-spore lies imbedded in lower part; × 150.—Fig. 4. A large resting-spore; × 315.—Fig. 5. Section through cavity containing several resting-spores; × 315.—Fig. 6. Sorus, with portion of reddish brown covering adhering to one side; × 315.—Fig. 7. Sporangium of same; × 315.

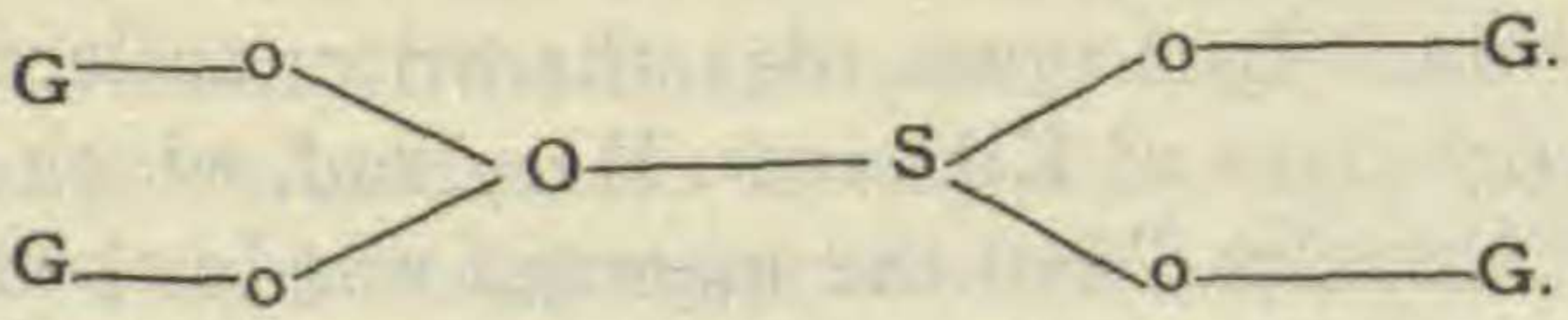
Formulæ for life histories.—I have found certain formulæ very useful in presenting general life histories to my classes. I do not know whether others are using them or not. If not, it might be well to suggest them, for they are very helpful in fixing the broad facts.

G = gametophyte; o = gamete; O = spore (sexual or asexual); S = sporophyte.

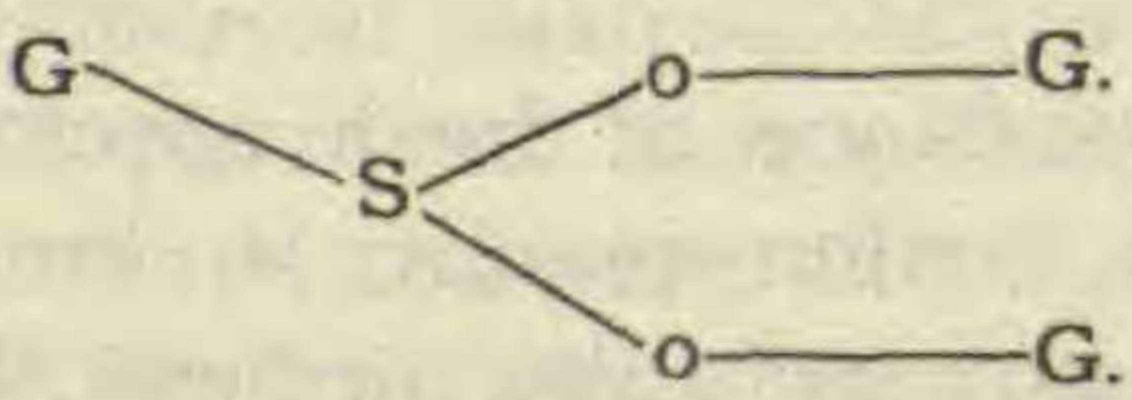
Isospory =



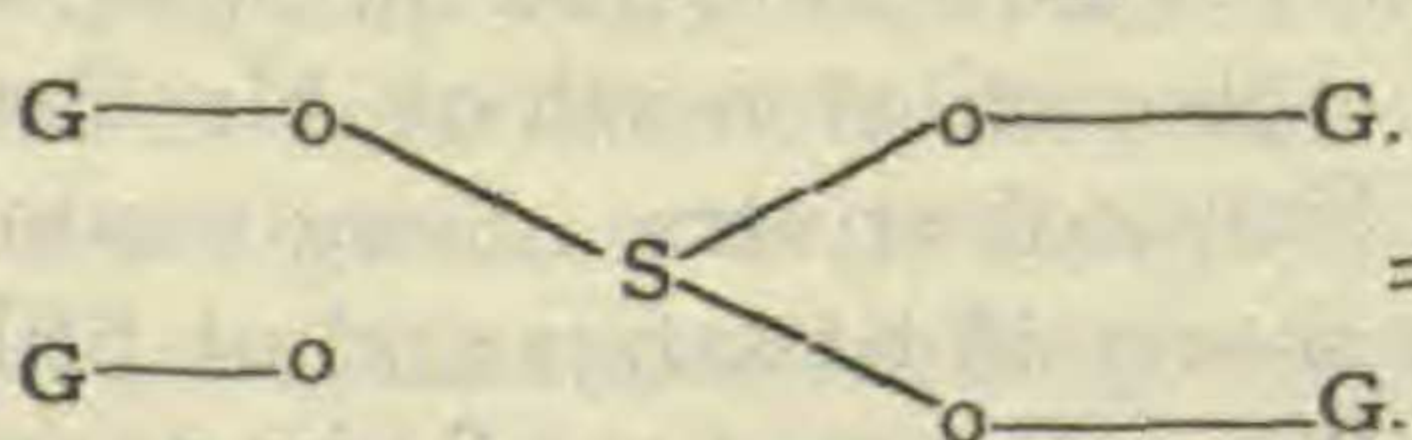
Heterospory =



Apogamy =

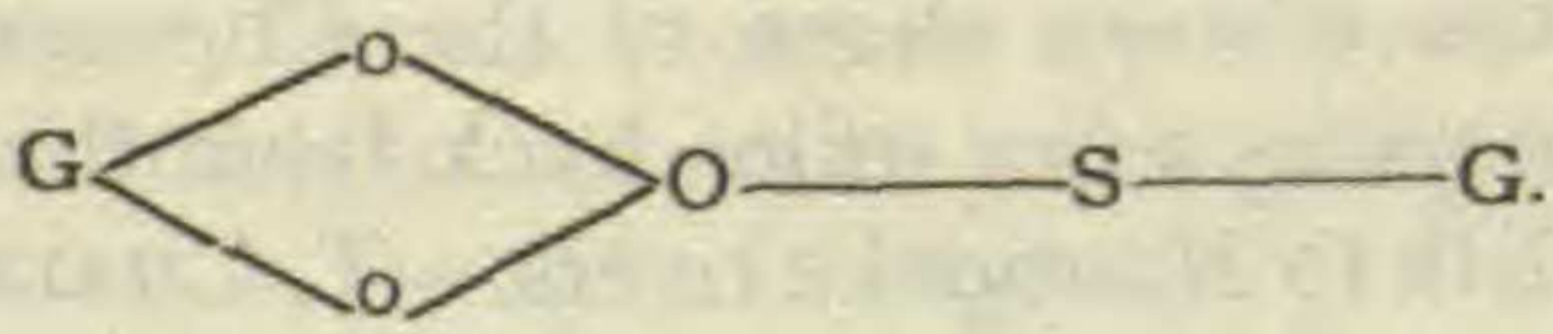


= vegetative apogamy, with heterospory.



= parthènogenesis, with heterospory.

Apospory =



and so on *ad infinitum*.

This is useful not only in presentation but in quizzing. For instance, ask a student to indicate in this way the life history of an angiosperm, a fern, a mildew, anything. It seems to make it very real to him.—John M. Coulter, *Lake Forest, Ills.*